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## DRAINAGE OF WOUNDS. WITH SPECIAL REFERENCE TO DRAINAGE AFTER URETHROTOMY.

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Drainage, in the treatment of wounds, has been used from a very early day, but its estimated value has received more marked attention in modern times in connection with general antiseptic treatment. And yet opinions still fluctuate in regard to the need of this means as a portion of the technique of modern wound treatment. The practical surgeon of large experience must occupy a safe middle ground in the discussions of the value of drainage *per se*. The most tenable position is that which holds that every wound must be treated as a unit to secure the best results, and have the patient subjected to the minimum amount of danger.

Safety from local and general infection, and certainty of union *per primum*, are the chief considerations held in view. The latter result is never to be sought at the risk of encountering the former. The time was, when, to escape the fearful danger of infection, the surgeon entirely ignored the advantages of primary union. The open treatment of wounds was then the fashion, but to-day this is practised only in exceptional cases. Stuffing the wound spaces, or interposing at least some substance to prevent contact of surfaces; the rejection altogether of wound dressing, or the substitution of some light protective for the layers of charpie, smeared with cerate, as used in the French hospitals thirty years ago, or the heavy compresses of cotton used elsewhere, to occlude the wound; the total abandonment of sutures and adhesive strips, for accurately closing wounds, and the resort to *debridement* of deep wounds, were a few of the methods which then took the place of modern plaus for effecting drainage. Primary union was, by one or other of these means rendered almost impossible. Notwithstanding this, secretions and exudates were not effectually disposed of, and consequently infection or sepsis was by no means prevented. This was before the introduction of the germ theory, or the study of Bacteria or Phagocytes; be-

fore Listerism attracted attention, or threatened, as it has done, to revolutionize surgical doctrine and treatment.

The danger resulting from retention of blood or inflammatory secretions, and of subsequent putrescence of these materials was fully recognized. The necessity for the escape of blood-serum, lymph and pus was admitted. By preventing primary union, insuring free openings in the tissues, and utilizing the principle of gravity, the proper indications for treatment were, to a fair extent, carried out. Wounds of natural cavities were known to be extra dangerous, and the closed spaces of wound surfaces were looked upon as cavities upon a small scale, and dangerous because of their capacity for retaining secretions or exudates. Another fact was fully recognized, viz: that subcutaneous wounds enjoyed freedom from infection. Where no air entered, no decomposition or sepsis was feared, and no pus was looked for. Still the entrance of a living germ was not regarded as necessary to the formation of pus. When finally Listerism came, with its germ theory as associated with infection, it did not pretend to disregard many of the old principles of treatment. It accepted many of the views to which I have briefly referred; but with the old knowledge it introduced a new factor to explain much that was obscure. It accepted the drainage of wounds as one of the most important factors of treatment, but this simply because all wounds were not subcutaneous in their character. It announced the great importance of excluding germs from without—no germ, no decomposition, no putrescence, no infection, no suppuration, as a rule. But Listerism did not insist upon the doctrine of no suppuration without bacteria. If this latter doctrine be true, it is an advance beyond what Lister claimed.

With free drainage as practiced in our own times, we can insist that the ingress of germs, or their lodgment, is improbable or uncertain. And further, it is comforting to believe that all micro-organisms are not potent for evil. Primary union, and the absence of infection, are often noticeable where bacteria have had ingress, or where they have been purposely introduced. Dangerous germs are at times controlled or destroyed by leucocytes that pertain physiologically to the parts. The war of cells, then, must not be forgotten, as one of the possible contingencies which may assist the surgeon. The conservative surgeon, however, in the face of the recognized facts referred to, must prefer to exclude the possibility of the entrance of germs,

while he accepts the necessity of providing specially for the escape of exudates. Further, he prefers in the treatment of wounds to guard against all chances of decomposition within the wound, to make use of agents known to be inimical to germ life, and to dress the wound with materials which act as barriers to the ingress of all germs from without. Accepting even the doctrine of Phagocytosis, the ability of certain cells to absorb or digest microbes, he need not, because of a specious theory, jeopardize the safety of his patient. This scheme of treatment, together with the necessary prevention of further traumatism by proper rest and protection, may be said to constitute modern Listerism. There may be differences of opinion as to the real value of the several factors going to make up the ideal treatment, but this does not detract from its value as a method promising good results.

The above remarks, though properly pertaining to the subject of wound drainage in general, are especially pertinent to the subject of drainage in connection with the operation of urethrotomy. We have, in connection with such operation, a narrow and tortuous canal, not strictly uniform in calibre, but physiologically narrower at regions, connected anatomically with surrounding and contiguous structures which present complications when suffering from the effects of lesions, related to muscles, blood vessels and nerve tissue which, under associate injury or sympathetic disturbance, give at times serious results, or afford predominant symptoms to be duly recognized if treatment is to be successful. This canal is a conduit for an important secretion which, in traumatisms, becomes a most important factor in determining the results which follow. The comingling of this secretion, either in its physiological or pathological condition, with the blood or inflammatory products, or with foreign germs which may occupy regions of the canal, or its entrance into spaces created through traumatism, may at once determine the issue which decides the fate of the individual.

It must not be supposed, however, that we are to regard the many serious consequences reported to have followed urethrotomies as always attributable to conditions which drainage is capable of obviating. The peculiar nervous arrangement at the deep part of the urethra, and the prostatic region, or neck of the bladder, we regard as often responsible for serious symptoms, and sometimes for death. These results can at times be explained in no other way,

and we are perfectly justifiable, however mortifying it may be from a scientific standpoint to say so, to speak of nervous sympathy, reflex irritation, and disturbance of the sympathetic system in connection both with slight and grave conditions encountered. The passage of a catheter or bougie will, in some instances, be followed by severe chill, by syncope, or by convulsions, and later by bloody urine or by the total arrest of urinary secretion, or by rise of temperature and other signs of acute pyrexia. Independent of the nervous connection, however, there may be serious hemorrhage, and the blood may flow either towards the meatus, and there escape, or backwards, and enter the bladder. Wounds of the bulbo-membranous region are often followed for many days by bloody urine. There may be both blood clots and fluid blood mixed with the urine, and at times the bladder fills to such an extent with blood clot that it cannot be emptied even by the use of the catheter. Clots lodge likewise in the wounds, and decomposition may occur in the bladder and outside of it. The admixture of unhealthy urine with blood and inflammatory exudates almost certainly generates a poisonous material, and now may rapidly supervene all the marked symptoms of septicaemia, sapraemia, or pyæmia. Bacteria soon abound, and whether introduced from without, through the meatus, or reaching the bladder and the deep wounds by other channels of entrance, they play the important role which compels us to associate them with the fearful casualties so long known in surgery. All parts of the urethral canal are not, however, alike susceptible, or to the same extent responsible for the development of serious disease. The deeper the site of the lesion, as regards the length of the canal, perhaps the greater the likelihood of the development of the serious pathological conditions to which I have referred. Wounds at the meatus rarely give trouble in this way. The pendulous, or penile portion of the canal, readily drains towards the meatus. The uninterrupted flow of healthy urine will serve to remove clots, and tend to keep all anterior wounds free from noxious elements likely to occasion infection. With the presence of diseased urine, however, even the anterior portion of the canal may enjoy no immunity from sepsis, and the deeper portion affords such constant evidence of the serious nature of lesions under these conditions, that internal urethotomy of the deeper parts of the canal can hardly be regarded, in the light of modern knowledge, as a warrantable operation.

It becomes, then, a practical question whether drainage cannot obviate these serious calamities known to be connected with urethrotomy, how it can be used to the best advantage, and in what kinds of urethral operations is it most imperatively demanded. Both drainage of the bladder and drainage of the urethral canal must be considered in this inquiry, and under the conditions both of physiological and pathological states of the urinary secretion. We need not stop to remark upon what constitutes unhealthy urine, and the means of determining its existence. The character of the urine, so far as it concerns the surgeon in regard to its probable effect upon urethral wounds, may be easily ascertained by inspection, by its odor, its viscosity, its specific gravity, or by its behavior under proper chemical and microscopical examinations. But the proper rule for the surgeon to observe in dealing with all urethral lesions is to err on the safe side, and protect in all cases against the possibility of an abnormal secretion. Fortunately, we have modern means at our disposal capable of quickly modifying many disordered conditions of the urine. In Boracic acid, Salol, Saccharine, and other articles, we have valuable adjuncts to the common surgical resources. Natural drainage of the bladder is all that is needed when the expulsive powers of the organ are perfect. When there is, of course, no paralysis, no dilatation, no sacculated condition, no thickening of its walls, no cystitis, no obstruction at the neck and no narrowing of the urethral canal. With healthy urine, physiologically expelled, there is no serious apprehension to come from lodgment or detention of the secretions after urethrotomies of the penile portion of the canal. The natural passage of healthy urine will on the contrary, as already suggested, serve to exempt from many dangers. Blood clots are washed out, inflammatory secretions are diluted and removed, pathogenic bacteria are not permitted to lodge and germinate. The natural drainage of the bladder then is the best drainage when we are assured of the healthy state of the urine. The only question is whether we shall always infer the healthy condition of the secretion, or whether it is a safer rule of practice to assume that it is not healthy, and to protect the urethral wound accordingly; in other words, whether we should not always drain the bladder artificially and prevent any contact of urine with the wound.

In determining this question, we must not forget to estimate the probable injurious effect upon the wound from the

use of even the most improved instruments for artificial drainage. This drainage is accomplished by the use of the catheter, which must pass the entire length of the canal to reach the bladder. This must be allowed to remain in position, or it must be withdrawn and again introduced as many times a day as may be necessary. In either instance, the wound is irritated, and the manipulations are painful. Then the retained catheter becomes, sooner or later obnoxious to the bladder, and possible complications may arise from persisting in its use. Drawing off the urine insures frequent contact of the secretion with the wounds, no matter how carefully the catheter is used. Neither is a third plan often resorted to, viz: retaining the catheter in the canal with its eye just anterior to the neck of the bladder, and only urging it onward into the cavity when it is desired to draw off its contents, any less objectionable.

The larger our experience the less satisfied have we become with the use of the catheter *à demeure*. No matter how well it be secured, it is liable to be misplaced accidentally, or by the efforts of the patient. The soft rubber catheter generally used, will, in time, under the irritable action of the bladder, be doubled up, so that the beak emerges from the cavity, and some urine of necessity escapes with it. We subject the patient to all the annoyances of the instrument, and we encounter the very evils that it was our object to avoid. Where the catheter *à demeure* is resorted to, however, we always prefer the old stiff English, elastic instrument, now but seldom used. It can be better secured at the meatus, and it is much less likely to double up, or to protrude from the cavity under the contractions of the organ. Anodynes internally, or by the rectum, will help to quiet the bladder and better insure the retention of the catheter.

But in all cases of urethrotomy of the penile portion of the canal, our preference is for natural drainage of the bladder, and of the canal, and the rejection of the catheter. The urine we try to modify in advance by the use of Boracic Acid Salol or Citrate of Potas.; and the bladder is also, when necessary, treated in advance by suitable injections. After this the urethrotomy is done and the patient allowed to urinate by the natural way. In case of undue hemorrhage, a large sized English catheter is tied in for twenty four or forty-eight hours, and then removed. When the catheter *à demeure* is used, of course drainage of the wound and the urethral canal goes on outside of its wall, and this may be all that is necessary. Where no catheter is employed, there is the

opportunity, which I always embrace, of washing out the canal, by the meatus, several times a day with Thiersch's, or some other unirritating antiseptic solution.

Internal urethrotomy as practised upon the deep urethra, or any portion posterior to the bulbo-membranous junction, must always give rise to much greater solicitude than the operation on the anterior portion of the canal. Here drainage of the bladder alone is not the important question. The drainage of the canal, from the site of the wound, is the chief consideration; but at the same time, the bladder has to be drained as in the anterior operation, and even more care should attach to protecting the wound from the contact of urine. Natural drainage cannot be trusted to, for this will not be found efficient. The flow of blood and inflammatory secretions is as likely to be backward to the bladder, as forward to the meatus. The relation of the parts is such that drainage in either direction is uncertain, and lodgment of products is likely to obtain. We have then the very conditions favorable to sepsis and local and general infection. Infiltration of urine, too, is one of the serious evils to be apprehended, and so is hemorrhage.

Where such operation is practised, surgeons are almost uniformly of opinion, that a catheter should at once be passed into the bladder, and retained for twenty-four or forty-eight hours. This is to guard from hemorrhage, and from urinary infiltration, as well as to protect the wound from the effect of urine, which is, by many, regarded as injurious in its effects, even in its normal condition. Drainage goes on, of course, only along the outer wall of the retained catheter. But is this efficient? and is it safe to trust to so imperfect a method? We would not so regard it in case of an open or superficial wound, where we thought drainage necessary. The capillary drainage outside of the catheter, and from so deep a wound, is surely most imperfect.

From what we have already said upon the use of the catheter for bladder drainage in anterior urethrotomy it will be seen that we can place no reliance upon it here. We have learned this to our sorrow. What surgeon has not had the experience that I have had in visiting the patient, the first or the second day after operation, and learning that the beak of the catheter had been many times in and out of the bladder—or that the instrument had doubled on itself and escaped during the night? The most intelligent patient cannot be made to realize the danger of the escape of the instrument, and all that he will do is to push the

instrument back when he finds that it has escaped, or shows tendency to escape from the bladder. A conscientious nurse will serve no better purpose.

Experience has thus led me to believe that internal urethrotomy in the deep portion of the canal is an unsafe operation. The parts cannot be drained except by a direct perineal opening. Such operation, then, should be rejected unless it be followed by counter-opening through the perineum. The distinction has been made by some, and external urethrotomy separated from what has long been called perineal section. This is hardly necessary, and can have reference simply to the external division of parts being in the one case somewhat anterior to the usual site of the perineal wound. We prefer to say that perineal section should take the place of internal deep urethrotomy. The comparative ease in the performance of the respective operations, and the other arguments in favor or against such procedure we do not desire here to discuss. Our present argument against the operation of deep internal urethrotomy and our preference for perineal section, rests simply upon the question of efficient drainage. This is impossible in one operation, but can be secured in the other. As to the mode of operation, with or without a guide, we have nothing to do. We only urge that if the internal deep contraction of the canal is divided by the urethrotome there should be as well an external free incision. Through this incision both the bladder and the deep part of the canal can be drained. But how is this to be best accomplished? The usual plan has been to drain simply by the retained catheter, as after internal urethrotomy—that is, convey the urine away by the catheter and allow the wound and the urethral canal to drain outside of the walls of the retained instrument. This I regard as unsatisfactory and unsafe.

The necessity of artificially draining the bladder I would urge only in cases where the urine is abnormal. Under other circumstances the patient may be allowed to urinate voluntarily, the escape, of course, being through the perineal wound. Where the bladder is to be drained, this should be by means of a short catheter, or tube, passing through the perineal wound to the bladder, as after some lithotomy operations. This tube should be sufficiently rigid to be incompressible, and not capable of being doubled up by the contractions of the organ. It may be of rubber, or of silver, and of large calibre. It is best secured at the perineal wound by a strong silk suture passed through the cutaneous structures.

More important than the drainage of the bladder is the thorough drainage of the urethral canal. If more than one stricture has been divided, as is generally the case when perineal section is required for a deep contraction, the greater the necessity of this drainage of the entire canal. The plan I adopt is to pass a full sized tube, having velvet-eyed perforations, through the canal from the meatus to the perineal wound. It must be long enough to project through both apertures. The perineal end of the tube is secured to the tegumentary wound by a silk suture, just as with the tube coming from the bladder. All fluids now pass readily from the canal; none can be detained in the deep portions. If there be hemorrhage the blood will appear externally and not pass back into the bladder. Further, by means of a syringe the entire canal can be well washed out, from time to time, with a non-irritating antiseptic fluid.

This practice I have resorted to for a great many years. Although in the earlier part of my professional life, when adopting other plans generally in use, I had the misfortune, several times, to meet with fatal results after internal urethrotomy, and frequently to encounter the most alarming symptoms, since appreciating the principles and adopting the practice, here briefly outlined, the results have been all that could be desired.

The following conclusions may be thus formulated:

1. Urethrotomies for strictures of the *penile* portion of the urethra, including the meatus, require no artificial drainage. In case the urine is healthy, the natural passage of this is sufficient to prevent lodgment of blood or inflammatory exudates and subsequent decomposition, putrescence and sepsis.
2. To insure against the action of unhealthy urine, the secretion must be modified, before resort to operation, by the use of medicinal agents known to be efficient for this end. The bladder must also be treated, as preliminary, when its condition is such as to furnish diseased elements which give deleterious character to the urine.
3. If deemed necessary further to guard against the noxious character of the urinary secretion, the catheter à demeure must be resorted to for draining the bladder for 48

or 72 hours—the rigid English gum catheter to be preferred to the soft rubber one, as less likely to be displaced.

4. After internal urethrotomies of the *deep portion* of the urethra, drainage is most essential. This cannot be properly secured by the simple use of the catheter, and, therefore, it is best to abandon such operation and to substitute for it a perineal section, or external urethrotomy.

5. After this latter operation, drainage goes on securely because of the direct external opening. It should, however, be more thoroughly insured by a *perforated* drainage tube reaching from the meatus and projecting through the perineal wound, this to be kept in place for from three to five days.

6. Bladder drainage, after perineal section, is not essential if the urine is healthy. By the voluntary efforts of the patient the urine flows readily from the bladder and escapes through the perineal wound.

7. To better insure the escape of urine, however, through the perineal wound, and also prevent its contact with all lesions of the canal, a short tube, of large calibre and rigid walls, may be passed into the bladder from the perineal wound and kept in position by a suture passed through the tegumentary edge of the wound. This tube should be removed after three days.

8. The use of non-irritating antiseptic injections, through the tube occupying the canal, furnishes an additional precaution against sepsis. The bladder may also be easily washed out by means of the tube used for draining it through the perineum.

#### DISCUSSION.

Prof. Ashhurst being then called upon for an expression of opinion on the subject, said :

The operation for internal urethrotomy is not one that I very often resort to, and only where the stricture is limited to the anterior portion of the urethra, where it is upon the whole the best treatment, because treatment by dilatation is not very satisfactory. For posterior strictures I have never liked the operation, and have very seldom performed it. I

believe, as Prof. Kinloch has well pointed out, that in cases requiring any cutting the external operation, with or without a guide, is the best, according to the circumstances of the case.

There is an operation which, some years ago, attracted a great deal of attention—the operation of the splitting or rupture of the urethra as re-introduced by Mr. Holt; it was an old French mode of treatment. That is an operation which I did perform in a number of cases, with very good results, but it is a good many years since I have resorted to it at all. I never saw any bad results from it myself, but I know of cases among friends of mine, in which death did result. The rule that I have generally adopted in all strictures of the anterior portion is urethrotomy; strictures of the posterior portion, I believe, can be cured by dilation, beginning, if necessary, by first introducing a small catheter until the stricture is sufficiently dilated to allow of simple dilation.

